CHAPTERWISE QUESTION ANSWERS

ACIDS, BASES AND SALTS

CLASS X

SET A

SECTION - A OBJECTIVE TYPE

1. b) NaCl, H_2O and $CO_2(g)$
2. c) ii and iv
3. a) Carbon dioxide
4. d) 1-B, 2-A, 3-C
5. c) remained the same
6. a) The acetic acid dissolves readily in water
7. a) They give pink colour with phenolphthalein
8. a) $CaCO_3$, $Ca(OH)_2$, $CaOCl_2$
9. a) If both the assertion and the reason are true and the reason is a correct explanation of the assertion.
10. c) Assertion is true but reason is false.

SECTION - B

11. $CaSO_4 . \frac{1}{2}H_2O$ is the formula of the compound. The name of compound is 'Plaster of Paris' (Calcium sulphate hemihydrate).

$$\underset{\text{(Plaster of Paris)}}{CaSO_4 . \frac{1}{2}H_2O} + \frac{3}{2}H_2O \rightarrow \underset{(Gypsum)}{CaSO_4 . 2H_2O}$$

12. a) Highly soluble bases are called alkalies e.g., KOH.

    b) Bee sting contains HCOOH, formic acid which causes irritation. Baking soda (basic) neutralises HCOOH, therefore it gives relief from pain on rubbing it on sting area.

13. Sodium chloride is made up of a strong base, NaOH and a strong acid, HCl. Therefore, its aqueous solution is neutral in nature.

    Sodium metal reacts with water to form NaOH(Base) and H_2 gas:

    $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$

OR

When sodium hydrogen carbonate (Baking soda) is heated sodium carbonate is formed which on crystallisation forms washing soda:

$$\underset{\text{(Baking soda)}}{2NaHCO_3} \xrightarrow{\text{Heat}} Na_2CO_3 + CO_2 + H_2O$$

$$\underset{\text{(Washing soda)}}{Na_2CO_3} + 10H_2O \rightarrow Na_2CO_3 \cdot 10H_2O$$

SECTION - C

14. a. pH of our stomach is 2.0 and it is needed for the digestion of proteins in our body.
    b. Blood has pH = 7.36 to 7.42 which must be maintained for proper health.
    c. pH of soil is determined and suitable chemicals are added so as to make it suitable for growth of crops.
15. a. Phenolphthalein will turn pink in soap solution.
    b. Chlorine is the by-product of chlor-alkali process which is used in the manufacture of bleaching powder.
    c. Universal indicator specifies the various levels of H^+ ion concentration.
16. The reaction in which acid reacts with base to form salt and water is called neutralisation reaction e.g.,
    $NaOH + HCl \rightarrow NaCl + H_2O$
    $2KOH + H_2SO_4 \rightarrow K_2SO_4 + 2H_2O$
    $CaCO_3$ (Marble), $CaCO_3$(Chalk) are the two forms in which calcium is found in nature.

OR

a) $NaOH + HCl \rightarrow \underset{\text{Sodium Chloride}}{NaCl} + \underset{\text{Water}}{H_2O}$

b) $Zn + 2NaOH \rightarrow \underset{\text{Sodium Zincale}}{Na_2ZnO_2} + \underset{\text{Hydrogen}}{H_2(g)}$

c) $Ca(OH)_2 + CO_2(g) \rightarrow \underset{\text{Calcina carbonate}}{CaCO_3(s)} + \underset{\text{Water}}{H_2O(l)}$

17. In the absence of litmus, any other indicator like methyl orange, phenolphthalein, etc., can be used. Otherwise a natural indicator like turmeric can also be used.

    Some common indicators with characteristic colours are tabulated below.

S. No.	Indicator	Colour in acidic solution	Colour in neutral solution	Colour in basic solution
1.	Litmus	Red	Purple	Blue
2.	Phenolphthalein	Colourless	Colourless	Pink

3.	Methyl orange	Red/Pink	Orange	Yellow
4.	Tumeric Juice	Yellow	Yellow	Reddish brown

18. In the manufacture of sodium hydroxide, hydrogen gas and chlorine gas (X) are formed as by-product. Chlorine gas reacts with lime water to give bleaching powder, a bleaching agent. Thus, X is chlorine gas (Cl_2 gas).

    Y is calcium oxychloride or bleaching powder ($CaOCl_2$)

    The equation for the preparation of sodium hydroxide is

    $$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + \underset{(x)}{Cl_2(g)} + H_2(g)$$

    $$\underset{\text{Limewater}}{Cl_2 + Ca(OH)_2} \rightarrow \underset{\substack{(y)\\(\text{Bleachingpowder})}}{CaOCl_2} + H_2O$$

SECTION - D

19. a. Tap water contains ions which makes it a good conductor whereas distilled water does not contain any ions.

    b. Dry HCl gas does not dissociate into ions, so it has no effect on the litmus. Hydrochloric acid form ions, so it turns blue litmus red.

    c. Baking soda prevents the formation of lactic acid when milk turns sour.

    d. Acid is added to water slowly because the reaction is highly exothermic. If water is added to acid, then glass container may break due to lot of heat evolved.

    e. NH_3 dissolves in H_2O forming NH_4OH, therefore it acts as base:

    $NH_3 + H_2O \rightarrow NH_4OH \rightarrow NH_4 + OH^-$

OR

a) Hydrochloric acid is a strong acid because it is completely ionised in its aqueous solution. Acetic acid is only partially ionised. HCl reacts with Mg vigorously whereas acetic acid reacts less vigorously.

b) Aqueous solution of acid contain ions which carry current, it conducts electricity.

c) (1) With pH = 6 'A' is most acidic,
With pH = 12, 'C' is most basic.
(2) C < B < D < A is the increasing order of H+ ion concentration.
(3) pH paper will turn blue in 'C' with pH = 12, basic pH paper will turn green in D with pH = 7, neutral.

SECTION - E

20. i) Z = $NaHCO_3$

Y = Na_2CO_3

ii) $Na_2CO_3 + 2H_2O \rightarrow 2NaOH + H_2CO_3$

Strong base (z) weak acid NaOH ionises completely to give a large amount of OH^- ions whereas H_2CO_3 ionises partially to give a small amount of H^+ ions. Hence the solution is overall alkaline.

iii) Z is carbonic acid, a weak acid formed when Na_2CO_3 is dissolved in water.

iv) It is a salt of a weak acid and strong base.

SET B

SECTION - A OBJECTIVE TYPE

1. d) A : Tartaric acid : B : CO_2
2. d) $2NaCl_{(aq)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + Cl_{2(g)} + H_{2(g)}$
3. b) C > A > B
4. d) Monobasic acid H_2SO_4
5. b) Bleaching powder
6. a) ii, iii and v
7. d) Acid produces hydrogen molecules when dissolved in water
8. d) Na, NaOH and H_2
9. a) If both the assertion and the reason are true and the reason is a correct explanation of the assertion.
10. d) Assertion is false but reason is true.

SECTION - B

11. Soil 'B' is acidic, therefore it needs to be treated with powdered chalk to adjust its pH because chalk is basic, which will make soil neutral.
12. pH = 11 is basic

    pH = 5 is acidic

    pH = 7 is neutral

    pH = 2 is strongly acidic
13. a) Green precipitate of $Fe(OH)_2$ will be formed :

    $FeSO_4(aq) + 2NaOH(aq) \rightarrow \underset{\text{(Green ppt)}}{Fe(OH)_2 \downarrow} Na_2SO_4(aq)$

    b) White precipitate of $Al(OH)_2$ will be formed :

    $AlCl(aq) + 3NaOH \rightarrow \underset{(White\ ppt)}{Al(OH)_3(s)} + 3NaCl(aq)$

OR

On heating $NaHCO_3$ (baking soda), CO_2 (carbon dioxide) gas is given out that turns lime water milky.

$$\underset{\text{Baking soda}}{2NaHCO_3} \xrightarrow{\text{Heat}} \underset{\text{Sodium carbonate}}{Na_2CO_3} + H_2O + CO_2 \uparrow$$

While on heating Na_2CO_3. $10H_2O$ 9washig soda) water of crystallisation is given out and the salt becomes anhydrous. The presence of water of crystallisation given as product can be tested by treating it with anhydrous CuSO4 (white) which becomes blue in colour in its contact.

$$Na_2CO_3.\ 10H_2O \xrightarrow{\text{Heat}} Na_2CO_3 + 10H_2O$$

SECTION - C

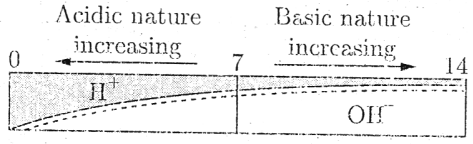
14. $$Zn(s) + 2NaOH \xrightarrow{\text{Warm}} \underset{\text{(Sodium chlorate)}}{Na_2ZnO_2} + H_2$$

Test : Bring a burning splinter near the gas. If it burns with 'pop' sound, the gas liberated is hydrogen.

$$Zn + H_2SO_4(dil) \rightarrow ZnSO_4(aq) + H_2$$

Hydrogen gas will be evolved by reaction of the same metal with dilute H_2SO_4, strong acid.

15. a) pH scale is a scale which is used for measuring hydrogen ion concentration in a solution.



b) pH < 7 is for acidic solution. pH > 7 basic solution, pH = 7 for neutral solution.

16. a. Hydrated copper sulphate, $CuSO_4.5H_2O$ is the name and chemical formula of that substance. It loses water of crystallisation on heating and regains these molecules of water on exposure to the atmosphere:

$$\underset{\text{Blue}}{CuSO_4\ .\ 5H_2O} \xrightarrow{\text{Heat}} \underset{\text{(Dirty white)}}{CuSO_4\ .\ 5H_2O}$$

$$CuSO_4(s) + 5H_2O(l) \rightarrow \underset{\text{Blue}}{CuSO_4\ .\ 5H_2O}$$

b. $Na_2CO_3.10H_2O$, washing soda (Sodium carbonate decahydrate) has 10 molecules of water of crystallisation. $CaSO_4.2H_2O$, gypsum, chemically calcium sulphate dihydrate has 2 molecules of water of crystallisation.

OR

a) 'X' is $NaHCO_3$ (Sodium hydrogen carbonate). 'Y' is CO_2 gas, which is used in fire extinguishers.

b) $NaHCO_3(s) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l) + CO_2(g)$

17. Strong acid – The acid that ionises completely in aqueous solution, thus producing a high concentration of H_3O^+ ions, is called a strong acid, e.g., HCl, H_2SO_4 HNO_3 etc.

Week acid – Weak acid ionises only partially in aqueous solution and thus it produces ions as well as molecules, e.g., acetic acid, carbonic acid.

Strong acid	**Weak acid**
Hydrochloric acid	Citric acid
Nitric acid	Acetic acid
Sulphur acid	Formic acid

18. a) The advantage of using baking powder is that tartaric acid present in baking powder reacts with sodium carbonate (Na_2CO_3) produced during decomposition of $NaHCO_3$ and neutralizes it. If only sodium hydrogen carbonate (baking soda) is used in making cake, then sodium carbonate formed from it by the action of heat (during baking) will give a bitter taste to cake.

b) By adding tartaric acid to baking soda we form baking powder.

c) Tartaric acid neutralizes the sodium carbonate formed during decomposition of $NaHCO_3$ hence, making the cake tasty and not bitter in taste.

SECTION - D

19. a. 'A' will show vigorous reaction.

b. H_2SO_4 is a strong acid, it reacts faster than H_2CO_3, a weak acid.

c. H_2 gas. If we bring a burning splinter near the gas, it will burn with 'pop' sound.

d. $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

$Mg + H_2CO_3 \rightarrow MgCO_3 + H_2$

e. H_2SO_4 will have lower pH. H_2CO_3 will have lower H^+ ion concentration,

OR

a) 'X' is NaOH. It is a base which is hygroscopic i.e., absorbs moisture from the atmosphere and turns sticky. It is also formed by the electrolysis of aqueous solution of brine by chlor alkali process:

$2NaCl\ (aq) + 2H_2O(l) \xrightarrow{Heat} 2NaOH(aq) + H_2(g)$

Neutralisation reaction will take place between NaOH and HCl:

$NaOH + HCl \rightarrow NaCl + H_2O$

b) It is because the process is highly exothermic. If we add H_2O to acid, the glass container may break due to excess heat evolved.

SECTION - E

20. i) The bulbs will start glowing as it contains hydrogen ions H^+ ions (aq) as cation and Cl^- or SO_4^{2-} as anion.

ii) They do not contains free ions neither cation nor anion. To conduct electricity, free ions are required.

iii) Acidic behaviour are shown by releasing of H^+ ions from acids. To dissociate into H^+ ions, the acids need medium i.e., water.

iv) Rain water will conduct electricity as it contains both positive and negative ions of different salts in it.

OR

The acid contains Hydrogen ions in solutions as well as anions. Due to the presence of free ions they conduct electricity.